

# **PUGET SOUND COORDINATED ECOSYSTEM MONITORING AND ASSESSMENT PROGRAM**

## **DRAFT CHARTER**

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### ***Problem Statement***

Well-designed and executed monitoring programs operate throughout the Puget Sound region. However, many are designed to meet specific agency mandates or direct local management decisions rather than meet the Puget Sound Partnership's need to understand the ecosystem and adapt management activities through time. In addition, no single monitoring program offers an ecosystem-wide view of the health of Puget Sound. Finally, monitoring activities need to be better coordinated across organizations and scales and findings made publicly available.

### ***Purpose***

The Puget Sound Coordinated Ecosystem Monitoring and Assessment Program (Monitoring Program) is integral to the adaptive management approach adopted by the Puget Sound Partnership. The purpose of the Monitoring Program is to coordinate the work of existing and future monitoring efforts to assess the effectiveness of recovery actions, evaluate progress towards ecosystem recovery and inform decision-making through adaptive management to achieve the goals of the Action Agenda. Finally, the Monitoring Program produces, synthesizes and integrates results and communicates findings transparently and effectively to the public.

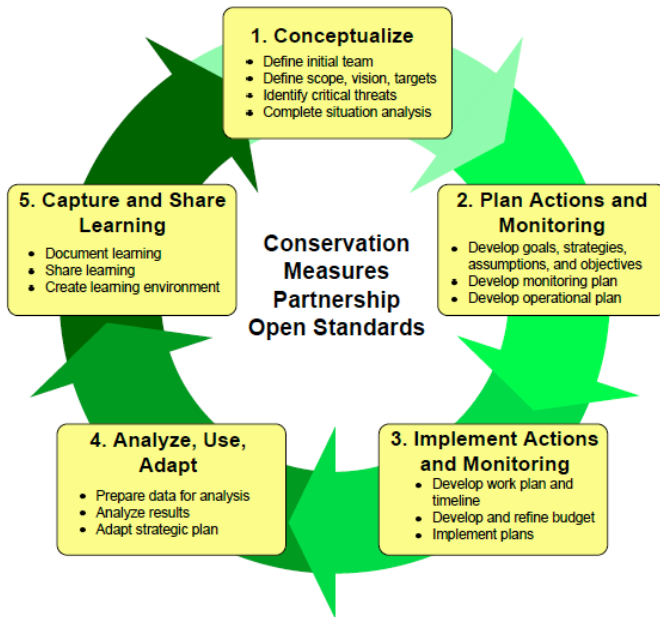
### ***Background***

Natural and social science information has given us a base understanding of how Puget Sound and its surrounding watersheds and communities work as a system. From this understanding, we have generated hypotheses about the state of Puget Sound and the

1 actions needed to restore the system to a healthy, self-sustaining condition. In response,  
2 diverse actions, as compiled in the Action Agenda, are being implemented to achieve  
3 recovery.

4  
5 Achieving a healthy Puget Sound requires a dynamic and transparent interface between  
6 structured information and the actions of many individuals and entities. Monitoring,  
7 coupled with the assessment of the monitoring results, are necessary means by which to  
8 obtain the structured information needed to evaluate the effectiveness of the investments  
9 for restoring the health of Puget Sound, inform ecosystem recovery and adapt  
10 management activities over time.

11  
12 The Puget Sound Partnership has adopted an adaptive management approach to improve  
13 recovery actions over time. Adaptive management is defined in RCW 77.85.010 as the  
14 “Reliance on scientific methods to test the results of actions taken so that the  
15 management and related policy can be changed promptly and appropriately”. As stated in  
16 the Puget Sound Partnership Strategic Science Plan, “adaptive management allows  
17 ecosystem recovery efforts to move forward in the face of uncertainty by ensuring that  
18 actions are evaluated against goals and where necessary, altered to optimize outcomes”.  
19 The Science Panel endorsed the use of the Open Standards for the Practice of  
20 Conservation (Conservation Measures Partnership, 2007) as the framework for  
21 implementing adaptive management cycle (Puget Sound Partnership 2010; Fig. 1).  
22 Planning and implementation of monitoring is a critical step in the adaptive management  
23 cycle (Conservation Measures Partnership 2007; Fig. 1). Therefore, a well-designed  
24 monitoring and assessment program informs and responds to policy decisions,  
25 management actions and scientific needs such that individual choices and management,  
26 policy and scientific decisions improve over time, ultimately leading to ecosystem  
27 recovery.



**Fig. 1 Adaptive management cycle as described in the Open Standards for the Practice of Conservation.**

A variety of monitoring and assessment programs already exist in the Puget Sound region. The Monitoring Program must build on existing efforts to improve monitoring of the health of Puget Sound and recovery efforts. In 2007, the Washington State Legislature recognized the need for a coordinated and integrated monitoring program to inform Puget Sound recovery efforts. The Legislature allocated resources to the Department of Ecology to begin the discussion on creating such a program, which led to the creation of the Monitoring Consortium and recommendations to the Legislature in 2008 on governance (Monitoring Consortium 2008).

In addition, the 2010 Puget Sound Partnership's Strategic Science Plan recognizes the importance of a coordinated and integrated monitoring program by stating:

“...Although it requires long-term stable funding to achieve, without monitoring, there can be no performance accountability, and the opportunities to make improvements in ecosystem recovery are constrained. Because of its critical importance, the Partnership will develop and implement a coordinated regional monitoring program....”

The Puget Sound Assessment and Monitoring Program (PSAMP) is a foundational monitoring program in Puget Sound that has improved communication among agency and academic organizations and increased coordination of monitoring. PSAMP is an interagency partnership formed in 1988 to assess the condition of Puget Sound and its

resources. Although PSAMP has been successful in assessing the cumulative outcome of collective management actions and has been reporting baseline information on various indicators of the health of Puget Sound, areas for improvement have been identified such as conducting effectiveness monitoring and strengthening ties to specific management questions and key external entities and processes (Puget Sound Assessment and Monitoring Program Steering Committee and Management Committee 2008). PSAMP and other monitoring at all levels of government, tribes, business, academia and citizen-science organizations exist throughout the Puget Sound region and should be considered as building blocks for a coordinated and integrated monitoring and assessment program (e.g., the Stormwater Work Group, the Puget Sound Salmon Recovery Monitoring and Adaptive Management Program and others).

The Puget Sound Partnership is charged with developing and implementing “a coordinated regional program for monitoring ecosystem status and trends, program and project effectiveness, and cause-and-effect relationships.” (Action Agenda Near-Term Action E.3.2). The Puget Sound Partnership is also mandated to develop a performance management system “to improve accountability for ecosystem outcomes, on-the-ground results, and implementation of actions.” Therefore, a variety of monitoring results will be integrated in the Performance Management System at the Puget Sound Partnership.

## **Goals**

- 1. Ensure monitoring and assessment of key indicators in Puget Sound as critical elements of decision-making through adaptive management.**
  - a. Ensure data collection, analysis, management and reporting of priority indicators for ecosystem, human health and well-being, programmatic components, threat reduction and strategy effectiveness.
  - b. Develop monitoring and assessments necessary to evaluate whether the recovery actions, as prescribed in the Action Agenda, are meeting the six recovery goals stated in RCW 90.71 (water quality, water quantity, species and food webs, habitats, human health and well being).
  - c. Establish new and assess existing monitoring to determine the effectiveness of recovery actions, evaluate progress towards ecosystem recovery and inform decision-making through adaptive management to achieve the goals of the Action Agenda.
  - d. Ensure linkages between implementation, compliance, effectiveness and status and trends monitoring.
- 2. Work in a collaborative, transparent fashion with a broad range of interested entities to make monitoring more effective and to better coordinate and**

**integrate ongoing and new monitoring across Puget Sound and the rest of the Salish Sea.**

- a. Build consensus on who should monitor what, when, and where and provide recommendations for establishing the highest monitoring priorities.
- b. Ensure that Puget Sound regional monitoring results contribute to local, sub-regional, statewide, Pacific Northwest, and national assessments and cross-topic integration to the extent possible.
- c. Ensure coordination and cross-topic synthesis of monitoring conducted in support of existing management actions and policies, such as the Clean Water Act, Endangered Species Act, Shoreline Management Act and Growth Management Act.
- d. Strategically build on monitoring already underway or planned by various monitoring at all levels of government, tribes, business, academia and citizen-science organizations that exist throughout the Puget Sound region to achieve our goals.

**3. Ensure data are credible, trusted, and available with known precision, accuracy, and certainty.**

- a. Increase accessibility to data and coordination of data collection, data management, analysis and reporting among monitoring entities to reduce duplication of effort, while recognizing various mandates.
- b. Promote development and implementation of standardized protocols and methodologies to better integrate data across various scales, participants, and geographic regions.

**4. Ensure findings are communicated to a broad audience including the scientific, management and policy communities, decision-makers, tribes and the public.**

- a. Compile, synthesize and communicate monitoring and assessment findings that “tell the story” about Puget Sound including the funding needed to conduct the ongoing monitoring.
- b. Facilitate reporting of findings in the State of the Sound report and the Puget Sound Partnership Biennial Science Work Plan.

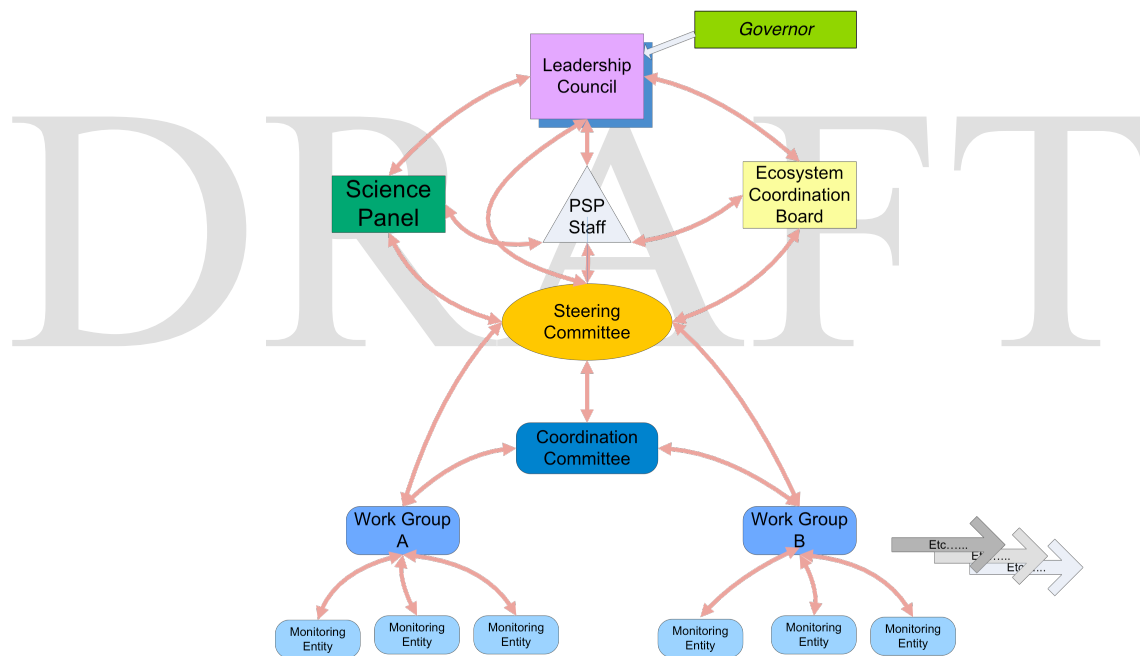
***Roles, Responsibilities and Relationships***

***Program Structure***

The program components of the Monitoring Program envisioned in this Charter consist of several groups that are already established including the Science Panel, Ecosystem

Coordination Board, Leadership Council, and Puget Sound Partnership staff, as well as new components such as Work Groups, Coordination Committee, and Steering Committee. The participation of various programs housed at monitoring entities is also anticipated.

The Monitoring Program structure engages multiple partners and stakeholders at technical, scientific and policy levels within a hierarchical decision-making structure (Fig. 2). The Monitoring Program is overseen by the Steering Committee and is designed such that information necessary to make recommendations and decisions flows from the Work Groups and the Coordination Committee up to the Steering Committee. However, we assume two-way interactions between each of the program components, facilitated by Puget Sound Partnership staff. The Science Panel, Ecosystem Coordination Board and Leadership Council are either informed or consulted or are ultimately the decision-makers, depending on the action.



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Fig. 2. Structure of the Puget Sound Coordinated Ecosystem Monitoring and Assessment Program depicting the program components and their relationships.

The descriptions below summarize the composition and general roles of each program component. For a more detailed description of the roles and responsibilities of each program component recommended by the Launch Committee, please see Appendix 1.

### ***Summary of Roles for the Program Components***

## **Monitoring Entities**

Composition: The monitoring entities represent organizations involved in monitoring of the Puget Sound ecosystem at all levels of government, tribes, business, academia and citizen-science organizations.

Role: The monitoring entities are responsible for collecting, managing, analyzing, and reporting data for their organizations. The data contributed from these entities form the basis of the Monitoring Program's information needs.

## **Work Groups**

Composition: The Work Groups include representatives of state, local, and federal agencies, tribes, business, environmental groups, universities and other research institutions, and other key stakeholders that conduct monitoring and assessment activities in the Puget Sound. The Steering Committee is responsible for identifying and commissioning Work Groups. Each Work Group has a chair and vice-chair selected by the Work Group members.

Role: The Work Groups are a key element of the Program and provide a forum to determine monitoring and assessment needs, help to evaluate and prioritize monitoring for their specific topic and provide accountability for the Puget Sound ecosystem recovery effort. They help prioritize the monitoring and assessment needs, determine what data need to be collected where and how, and identify the capacity to collect and analyze the information. They ensure roll-up at the regional scales as possible. In some cases, the Work Groups direct or conduct studies, ongoing monitoring, and/or various types of assessment. Through a chair or other designate, they participate in the Coordination Committee to ensure that their efforts support and complement other topic areas and that information is collected in an efficient and cost-effective manner. Many of these Work Groups already exist (and are already funded) and should be built upon, but some new groups will need to be established.

## **Coordination Committee**

Composition: The Coordination Committee is composed of the chair or designate from the different Work Groups. The Steering Committee is responsible for identifying and commissioning the Coordination Committee and may add other representatives as appropriate. The Coordination Committee has a chair and vice-chair selected by the Coordination Committee.

Role: The Coordination Committee is under the direction of the Steering Committee. The Coordination Committee is responsible for ensuring coordination of Work Group

activities and integration across topics. This committee recommends who monitors what and where. It provides synthesis and inter-disciplinary approaches, analyzes data and writes reports when appropriate, and proposes monitoring plan changes.

### **Steering Committee**

Composition: The committee includes at least these entities: state agencies; federal agencies; local governments; tribes; environmental organizations; businesses; and research institutions. The representatives on the Steering Committee are people with scientific and environmental policy backgrounds and practical experience in specific topic areas. The Launch Committee will recommend to the Puget Sound Partnership how the Steering Committee should be appointed.

Role: The Steering Committee oversees and provides direction to the Work Groups and Coordination Committee on developing and implementing the Monitoring Program. It is ultimately accountable for some of the program's decisions. The Steering Committee is responsible for identifying and commissioning the Work Groups and the Coordination Committee.

### **Science Panel**

Composition: The Science Panel is appointed by the Leadership Council and is composed of nine scientists. The Science Panels general role is to provide the Leadership Council with independent scientific advice and peer review of the Action Agenda, Monitoring Program, and indicators.

Role: The Science Panel is responsible for reviewing the Monitoring Program for consistency with the Biennial Science Work Plan, the Action Agenda, and sound scientific principles. It is ultimately accountable for some of the program's decisions.

### **Ecosystem Coordination Board**

Composition: The Ecosystem Coordination Board is composed of 27 members representing different interests around the Puget Sound region and is appointed by the Leadership Council. Their main role is to advise the Leadership Council, be its eyes and ears on citizens concerns, and provide outreach and education on the Action Agenda.

Role: The Ecosystem Coordination Board is informed of the progress to develop and implement the Monitoring Program and is consulted about key decisions. The board provides a linkage to different stakeholder concerns and issues.

### **Leadership Council**



Composition: The Leadership Council has seven members and is appointed by the Governor. The Leadership Council is the governing body of the Puget Sound Partnership.

Role: The Leadership Council provides the overall direction for the Monitoring Program by establishing the goals, objectives, and strategies for the Puget Sound Partnership to successfully implement the Action Agenda. The Leadership Council also approves the governance framework of the Monitoring Program.

### **Puget Sound Partnership Staff**

Composition: The Partnership has a Monitoring Program manager and staff who provide support to all levels of the Monitoring Program. Other Puget Sound Partnership staff including the Science Program Director, Technical Program Manager, Chief Information Officer, Performance Manager and technical staff is anticipated to support the Monitoring Program as needed.

Role: The Partnership staff is responsible for convening, coordinating and monitoring the progress of Work Groups and the Technical and Steering committees, and ensuring the work supports the Puget Sound Partnership Action Agenda. It leads the effort to compile, analyze, and manage data and to produce and interpret results at the ecosystem level. The staff coordinates the development of the State of the Sound report, and ensures the integration of the Monitoring Program findings in the performance management system.

### ***Data Management and Access***

A key objective of the Monitoring Program is to collect, combine, evaluate, and share data from multiple contributing partners and sources. The Monitoring Program's approach to data management should serve to unite information and data from multiple sources to better answer questions and support decision making at all scales (local, watershed, regional, and even statewide). To accomplish this, data must be:

- 1) Accessible (allow for easy discovery and be accessible to all interested parties – including outside researchers and the public).
- 2) Comparable (indicators and metrics to be measured must be clearly defined and measured using comparable protocols and methods)
- 3) Shareable (data must be transferable between different organizations and data management systems).

Large, multi-agency monitoring programs are often challenged by incompatibility among data management systems. This is a typical outcome of numerous agencies having developed a variety of individual data management systems over many years – each designed to meet a specific program need, set of mandates, or funding proviso – and each

designed for individual efficiency and developed using whatever information technology or software was current at the time.

The key steps to development of an integrated, robust, flexible, and collaborative data management system are outlined in the Puget Sound Strategic Science Plan (Puget Sound Partnership 2010; Section 4.3.3). The Strategic Science Plan envisions a data architecture that provides discovery, access, and visualization of data across a network of distributed data management systems maintained by individual monitoring partners. Many organizations involved in Puget Sound have made substantial investments in data collection and information systems to support their needs. The Strategic Science Plan recommends that the Monitoring Program takes advantage of, but enhances the connectivity between existing data repositories and clearinghouses already established in the Puget Sound region. From a practical perspective, this means most data continue to be owned and managed by the organizations that collect it, but with a recognition that the Monitoring Program (and all users) benefits by gaining access to those data. Likewise, the data providers themselves benefit as the Monitoring Program works to expand their access to comparable or complimentary data sets collected by other agencies and groups.

Therefore, the initial data management goals of the Monitoring Program are (1) to assess the compatibility among the data management systems and data repositories currently in use across the Puget Sound basin and to develop and implement a plan for improving their compatibility and connectivity; (2) to facilitate and support the creation, documentation, and use of standard data collection protocols for all facets of field sampling, thereby enhancing the comparable nature of the data; and (3) to develop a data management strategy that assures key information flows (for indicator data and for data needed by managers, stakeholders, researchers, and the general public) are coordinated, available, and accessible.

### ***Reporting and Communication***

Communications and reporting are pivotal functions in the Monitoring Program. To support its work, the program relies on resources and information being provided from many different sources. Each of these people and organizations needs a clear understanding of what information is required and how it is used. Also, the program's success will be measured through its ability to support adaptive responses by Puget Sound Partnership leadership and other decision makers. This depends on reporting that is clear, creative, and compelling.

To boost the effectiveness of the Monitoring Program, a communications and reporting strategy must address the interface between science and policy. This requires engaging multiple sources of expertise in an integrated and collaborative process. It includes

building confidence that the information generated is relevant to decision making, is technically credible, and is not biased by political influence. The strategy should seek to build a common understanding of how science works, what it does best, and what are reasonable expectations as to the certainty of results.

### ***Communications***

The implementation of the Action Agenda relies on the participation by many agencies, tribes, individuals, and stakeholder groups. Some actions are mandated specifically in various statutes and programs, but many are voluntary and are less clearly defined. The Monitoring Program reflects this diversity of roles, and its success depends on creating a common understanding among participants and motivating them to provide consistent, high-quality information. To accomplish this, the Monitoring Program should make active and continual efforts to enlist participation in the Work Groups and to seek resources for completing the work.

Specifically, the goals of the communications efforts are to:

- Describe the rationale for and components of the Monitoring Program.
- Develop a matrix of communication strategies for multiple audiences.
- Define the relationship between the Monitoring Program and monitoring efforts conducted by others for individual functions and geographies.
- Demonstrate how monitoring information is used to inform decisions by Puget Sound Partnership leadership and other entities.
- Specify information requirements, protocols, formats, and schedules.
- Articulate the need for funding and other resources to accomplish this work.

### ***Reporting***

Key goals of the Monitoring Program are to inform decisions and motivate actions by many individuals and groups. To do this effectively, the Monitoring Program must help answer three types of questions. Is the ecological health of the Puget Sound Region getting better or worse? Are Action Agenda Near-term Actions being implementing and are those actions producing the desired outcomes? What additional monitoring and actions are needed? Addressing these questions with multiple audiences involves a number of steps and an orderly sequence of reporting. The results should be an intentionally designed suite of events and reports, produced on regular cycles – monthly, quarterly, annually, and longer. These products must respond to and be integrated with other key products of the Partnership, such as the Biennial Science Work Plan and the State of the Sound report. The events and reports should be easily accessible. The reporting functions:

- Reflect the Monitoring Program’s commitment to quality assurance and rigorous peer review of science products.
- Collect accurate information in appropriate formats; assemble results of analysis and evaluation; and articulate the degree of confidence and consensus around monitoring outcomes.
- Develop conceptual models and content methods to “tell the story” to different audiences; in addition to ecological content, address process issues such as accuracy, certainty, significance, risk, and cost/benefit.
- Coordinate reporting by multiple participating organizations and programs.
- Provide information and analysis in ways that support decision-making and inform the general public.
- Frame decision points and next steps to help prioritize and motivate future actions.

### ***Peer Review***

Peer review helps to ensure that monitoring findings are credible, independent, effective, open and transparent, legitimate, and salient. Peer review is recognized by many tribal, local, state, and federal agencies as an essential component of any program (e.g., Peer Review Advisory Group for EPA’s Science Policy Council 2006; Van Cleve et al. 2004; WAC 365-195-900; Puget Sound Water Quality Authority 1995; Puget Sound Assessment and Monitoring Program Steering Committee and Management Committee 2008; Puget Sound Partnership 2010). Finally, the process and results of peer review help avoid potential conflicts among different groups.

The Puget Sound Leadership Council believes peer review is important and will ask the Steering Committee or a third party independent entity to set up a rigorous, independent peer review process to review:

1. Monitoring program functions and processes.
2. Questions being asked.
3. Methods proposed to answer the questions.
4. Results and conclusions.
5. The application of the results to the adaptive management plan.
6. At the programmatic level, the framework and strategies used for achieving the results.

Consideration will also be given to whether or not formal peer input should be incorporated into the development of the Monitoring Program. At a minimum, the Academy will consider the requirements of the Science Panel and EPA as needed.

## ***Quality Assurance/Quality Control (QA/QC)***

A good QA/QC program is essential to ensure that data are of an acceptable level of quality and the level of quality is well documented. Guidance for quality assurance and quality control are widely available (e.g., Puget Sound Water Quality Authority 1988; Puget Sound Assessment and Monitoring Program Steering Committee and Management Committee 2008; Puget Sound Stormwater Work Group 2010). A QA/QC plan should be developed and implemented for all those contributing data according to the guidelines included in:

1. *Stormwater WG (2010), or*
2. *US EPA 2008*

It is cost effective to implement a stringent and rigorous quality assurance quality control process within the Monitoring Program. It will make any discussion or controversy focus on the interpretations, not the science and facts. Such a process will make for a more efficient and faster adaptive management cycle. The measures will build trust amongst stakeholders and agencies. It will reduce uncertainty about decisions, and improve decision-making and decisions over time.

## ***Funding***

The coordination, administration, and scientific activities of the Monitoring Program require long-term and stable funding. It is essential to factor in the costs of having a program that measures and reports on the conditions and effectiveness of recovery actions when planning studies, projects, and strategies in order to effectively improve the health of Puget Sound. Careful planning, strategic monitoring, coordination, and sharing of information can reduce the costs of monitoring.

Funding of the Monitoring Program is complex because multiple groups participate in the Monitoring Program to implement a variety of functions and activities (Appendix 1). The Work Groups and Coordination Committee will recommend what, when and where to monitor to the Steering Committee as well as estimate costs and provide ideas for strategies to fund monitoring functions and activities. The Steering Committee will evaluate the needs and strategies for funding, and recommend how to distribute available funding. As the Monitoring Program evolves, strategies commensurate with the Monitoring Program functions and activities will need to be developed through the Steering Committee, the Science Panel and the Leadership Council.

## ***Glossary***

**Compliance monitoring:** Monitoring to ensure that the outputs meet the standards as required in the plan, or to comply with contractual or legal requirements For example a

culvert is replaced in a habitat restoration project. Did the culvert comply with the size, slope, and drop required in the approved specifications and permits?

**Components (according to Open Standards):** The goals, objectives, strategies, and assumptions that form the Action Plan.

**Conservation Target:** A limited suite of species, communities, and ecological systems that are chosen to represent and encompass the full array of biodiversity found in a project area. An example for Puget Sound is Chinook Salmon.

**Dashboard Indicators:** The Puget Sound Partnership environmental dashboard indicators include: Annual wild harvest of tribal and non-tribal commercial fisheries; percent of core beaches meeting water quality standards; number of acres of shellfish beds impacted by degraded water quality; number of recreational fishing licenses sold annually; marine water quality index; freshwater quality index; percent of monitored stream flows below critical levels; wild Chinook population abundance; southern resident killer whale population trends; Pacific herring spawning biomass; terrestrial birds; percent of marine and freshwater shorelines armored; areal extent of eelgrass; toxic levels in fish; level of toxics in marine sediments; changes in land use and land cover by type.

**Effectiveness Monitoring:** Determines whether a management action has been effective in addressing a threat to the environment. Depending upon the action taken, monitoring can be extensive or minimal. Action effectiveness monitoring has been tied to such threats as habitat restoration and enhancement, changes to hatchery operations, pollution discharge elimination systems, and harvest constraints. Proper action effectiveness monitoring is characterized by a before and after treatment design. Examples of ongoing action effectiveness monitoring include: Habitat Conservation Plans developed for private timberlands under the Forest and Fish Agreement, total maximum daily loading (TMDL) monitoring required under the Clean Water Act; Salmon Recovery Funding Board monitoring of habitat restoration projects, and harvest and hatchery monitoring required under the Endangered Species Act. Action effectiveness monitoring answers the question: Did the management action have the intended output being targeted?

**Evaluation** – An assessment of a project or program in relation to its own previously stated goals and objectives.

**Implementation monitoring:** Monitoring to ensure that the project is implemented as per plan and schedule.

**Key Ecological Attributes (according to Open Standards):** An aspect of a conservation target's biology or ecology that if present, defines a healthy conservation target and if missing or altered would lead to the outright loss or extreme degradation of that conservation target over time.

**Logic model/Results chains:** Logical Framework – Often abbreviated as logframe. A matrix that results from a logical framework analysis that is used to display a project's goals, objectives, and indicators in tabular form, showing the logic of the project.

**Monitoring:** (3 definitions)

- 1 a) Refers to the systematic process of collecting and storing data related to particular  
2 natural and human systems at specific locations and times (Busch and Trexler 2003).  
3 b) The periodic collection and evaluation of data relative to stated project goals and  
4 objectives. Many people often also refer to this process as monitoring and evaluation  
5 (Conservation Measures Partnership 2007).  
6 c) A range of activities needed to provide management information about environmental  
7 conditions or contaminants. Depending on the requirements of any particular situation,  
8 these activities could include conceptual and numerical modeling, laboratory and field  
9 research, preliminary or scoping studies, time-series measurements, data analysis,  
10 synthesis, and interpretation. A monitoring system is integrated and coordinated with the  
11 specified goal of producing predefined management information; it is the sensory  
12 component of environmental management (NRC 1990).

13 **Monitoring entity:** A federal, state, or local agency, tribe, non-government organization  
14 or volunteer group conducting systematic monitoring of an ecological or human attribute.

15 **Open Standards:** “Open Standards are common concepts, approaches, and terminology  
16 in conservation project design, management, and monitoring in order to help practitioners  
17 improve the practice of conservation. In particular, these standards are meant to provide  
18 the steps and guidance necessary for the successful implementation of conservation  
19 projects, and are developed through public collaboration, freely available to anyone, and  
20 not the property of anyone or any organization and can thus be freely redistributed.”

21 The *Open Standards* five steps that comprise the project management cycle. The steps  
22 include:

- 23 1. **Conceptualize** what you will achieve in the context of where you are working.  
24 2. **Plan** both your **Actions** and **Monitoring**.  
25 3. **Implement** both your **Actions** and **Monitoring**.  
26 4. **Analyze** your data to evaluate the effectiveness of your activities. **Use** your  
27 results to  
28 **Adapt** your project to maximize impact.  
29 5. **Capture and Share** your results with key external and internal audiences to  
30 promote  
31 **Learning**.

32 **Peer Input:** Recommended changes or additions to a report or monitoring procedure  
33 from other independent scientists or experts recognized as competent in their field and  
34 who will have the expertise and knowledge necessary recommend those changes.

35 **Peer Review:** Formal review of a publication or report by other independent scientists or  
36 experts recognized as competent in their field and who will have the expertise and  
37 knowledge necessary to determine whether the scientific paper or report has followed the  
38 scientific method and has presented clear conclusions based on scientific data provided in  
39 the report and having used clear statistical procedures.

40 **Puget Sound interested entity:** Any individual, organization or entity that has an  
41 interest in the health of Puget Sound and its watersheds.

**Quality Assurance:** Quality Assurance is about Process. It describes the proactive method of establishing a process that is capable of producing a product or deliverable that is error or defect free. In the world of natural sciences this is seldom possible. However, the level of precision and accuracy should be set, and the methods clearly defined that will provide the greatest confidence in the data.

<http://www.modernanalyst.com/Resources/BusinessAnalysisGlossary/tabid/231/Default.aspx#Q>

**Quality Control:** Quality Control is about Products or Deliverables. It describes checking a final product or deliverable to ensure that it is defect or error free and meets specifications. In the natural sciences it entails attempting to measure the precision and accuracy of results with known statistical confidence.

<http://www.modernanalyst.com/Resources/BusinessAnalysisGlossary/tabid/231/Default.aspx#Q>

**Status/Trend Monitoring:** Status monitoring characterizes existing environmental conditions. It is a starting point for future comparison of change. It may also act as a reference point for “Desired Future Condition”. Trend monitoring involves measurements taken at regular intervals. It describes characteristics of indicators over time. Examples of status/trend monitoring include; water quality, salmon population abundance, flow, habitat characteristics, toxin levels in organisms, etc.

**Validation (Cause and Effect) Monitoring:** Validation monitoring answers the question: Did the management output or outputs create the intended outcome? This question often involves evaluating the effects of numerous projects on a watershed or species. An example would be: Has the cumulative effects of habitat restoration actions in a specific river resulted in producing more juvenile salmon that migrate to the sea? Another example: Has the cumulative effects of changes in forest practice rules and methods resulted in improved water quality and instream and riparian habitat on forest lands?

**Viability Assessment (according to Open Standards):** An analysis of the conservation target to determine the acceptable range of variation and then an evaluation of its current status and its desired future status. The desired future status of all of the attributes of the target becomes the goal for this target.

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*Appendix 1*  
(see next page)

DRAFT

Appendix 1. Draft description of the roles and responsibilities of program components in implementing the functions or activities of the Puget Sound Coordinated Ecosystem Monitoring and Assessment Program. The monitoring functions or activities will be rooted in the adaptive management approach adopted by the Puget Sound Partnership.

Row #	Function or activity	Charter Goal Addressed	Program Components								Adaptive Management Step Addressed
			Monitoring entities	Work Groups	Technical Committee	Steering Committee	Science Panel	Ecosystem Coordination Board	Leadership Council	PSP Staff	
1	<p><b>Identify monitoring questions in service to the adaptive management plan and other critical information needs of the Puget Sound Partnership and uncertainties</b></p> <p>Questions will be in part derived from indicators for ecosystem, human health and well-being, threat reduction targets, and strategy effectiveness.</p>	1a, 1b	Contribute information to Work Groups to help identify the questions that current monitoring is attempting to answer and new questions	Determine what questions need to be answered about their topic to meet work group assignment from Steering and Technical Committees	Reconcile and integrate monitoring questions from all Work Groups	<p>Recommend monitoring questions and indicators</p> <p>Ensure participation of monitoring program components in development and refinement of questions and indicators</p> <p>Make recommendations to PSP staff and Science Panel on questions</p>	<p>Review questions, indicators and targets to determine if they answer Biennial Science Work Plan and Action Agenda</p> <p>Approve monitoring questions in service of the adaptive management plan before proceeding with implementation</p>	<p>Informed about and reviews questions, indicators and targets for any interested Puget Sound entity for their concerns</p> <p>Review and give input on questions, indicators, and targets.</p>	<p>Informed about on what results would be available from the monitoring questions and indicators</p> <p>Informed about and Puget Sound entities' concerns</p> <p>Approve indicators and targets</p>	<p>Support formulating monitoring questions, indicators and targets, and ensure coordination between different program components</p> <p>Manage the adaptive management planning process</p> <p>Take in policy and management needs and</p>	<b>Plan Actions and Monitoring</b>

Row #	Function or activity	Charter Goal Addressed	Program Components								Adaptive Management Step Addressed
			Monitoring entities	Work Groups	Technical Committee	Steering Committee	Science Panel	Ecosystem Coordination Board	Leadership Council	PSP Staff	
						and indicators  Take in policy and management needs and scientific issues as articulated by the ECB, the SP, and the Technical Committee and Work Groups				scientific issues as articulated by the ECB, the SP, and the Technical Committee and Work Groups	
2	Identify existing monitoring that fulfils the adaptive management plan and the remaining gaps, uncertainties, data quality issues and research needs	1b, 1c, 1e, 2a	Provide information to Work Groups about ongoing monitoring, data quality and gaps that address monitoring questions	Synthesize information from multiple monitoring entities and provide recommendations on prioritization of critical data gaps and monitoring needs, taking	Receive information from multiple Work Groups to ensure cross work group synthesis and integration and prioritize gaps across Work Groups	Review Technical Committee recommendations and evaluate whether information is adequate for prioritization step	No role	No role	No role	Support and ensure coordination between different program components	Plan Actions and Monitoring

Row #	Function or activity	Charter Goal Addressed	Program Components								Adaptive Management Step Addressed
			Monitoring entities	Work Groups	Technical Committee	Steering Committee	Science Panel	Ecosystem Coordination Board	Leadership Council	PSP Staff	
				into account different scales  Propose new questions where applicable							
3	<b>Recommend priorities and sequencing for new and existing monitoring that meets the needs of the adaptive management plan and other critical needs and uncertainties</b>	1b, 2a, 2b	Recommend priorities that address the monitoring questions	Evaluate and prioritize monitoring needs for their topic	Evaluate the priorities of each work group relative to criteria and prioritize across all Work Groups, while ensuring coordination across Work Groups and high quality science	Review Technical Committee results and make any adjustments based upon policy direction from the ECB and science direction from Science Panel  Makes recommendations to Science Panel for their approval and	Review and approves recommendations for priorities for consistency with the Biennial Science Work Plan and the Action Agenda  Approve criteria for prioritization	Priorities are vetted within the Board in order to obtain any interested Puget Sound entity input	Informed about monitoring priorities and interested Puget Sound entities' concerns	Support and ensure coordination between different program components and ensure consistency with Puget Sound Partnership needs	<b>Plan Actions and Monitoring</b>

Row #	Function or activity	Charter Goal Addressed	Program Components								Adaptive Management Step Addressed
			Monitoring entities	Work Groups	Technical Committee	Steering Committee	Science Panel	Ecosystem Coordination Board	Leadership Council	PSP Staff	
						then Leadership Council					
4	Design monitoring plans and work plans (includes doing literature reviews, designing protocols, quality assurance plans, sample sizes, implementation plans)	2b, 3a, 3b	Provide study designs, protocols, and quality assurance for ongoing and proposed new monitoring depending on topic and work group requirements  Adopt protocols and QA/QC plans to ensure consistency in data collection, management and analysis	Provide study designs, protocols, and quality assurance for ongoing monitoring and proposed new monitoring depending on topic and work group requirements  Determine criteria for assessing of monitoring designs and QA/QC  Evaluate trade-off between cost	Compile and publish all study designs and protocols across Work Groups  Review protocols and designs for overall consistency and roll up across jurisdictions and scales  Check for consistent and valid monitoring designs, QA/QC  Evaluate	Make recommendations on monitoring plans based on Science Panel approved criteria such as cost, precision and certainty  Endorse monitoring plans and work plans	Review and approve monitoring plans for consistency with high-level monitoring questions and priorities, Action Agenda and Biennial Science Work Plan  Incorporate monitoring plan in the Biennial Science Work Plan	Provide input on acceptable level of certainty/error	Adopt recommendations on level of precision and accuracy desired versus costs	Monitor progress and provide support	Plan Actions and Monitoring

Row #	Function or activity	Charter Goal Addressed	Program Components								Adaptive Management Step Addressed
			Monitoring entities	Work Groups	Technical Committee	Steering Committee	Science Panel	Ecosystem Coordination Board	Leadership Council	PSP Staff	
				and precision/certainty  Refine and improve indicators  Ensure roll up across jurisdictions and scales  Develop monitoring plans that include indicators as part of monitoring strategies where appropriate	trade-off between cost and precision/certainty						
5	Estimate and report costs of prioritized monitoring	1a, 1b, 1c, 1e, 2a, 4a	Provide to the Puget Sound Partnership information	Compile and review the expenditures on existing	Compile the cost estimates from all of the Work Groups	Make recommendation for overall priority of	Review cost estimates for consistency with the	Informed of costs and discuss interested	Informed of costs and Science Panel ECB input and	Support and ensure coordination between	Plan Actions and Monitoring

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			Monitoring entities	Work Groups	Technical Committee	Steering Committee	Science Panel	Ecosystem Coordination Board	Leadership Council	PSP Staff	
			<p>on current costs of monitoring that is included in the monitoring plan and/or necessary for implementing the Action Agenda</p> <p>Estimate costs for any new monitoring identified by the Work Groups and Technical Committee and that meets the Puget Sound Partnership needs</p>	<p>and new monitoring within their topic</p>	<p>to obtain an estimate of current PS monitoring program expenditures by all participating entities and the proposed new costs</p> <p>Evaluates overall costs of the program by ecosystem component and emphasis</p>	<p>current and new funding and possible shifts in funding within existing monitoring</p> <p>Adopt final proposal based on input from the Leadership Council, Science Panel and staff</p>	<p>Biennial Science Work Plan and the Action Agenda</p>	<p>Puget Sound entities' concerns</p>	<p>discuss interested Puget Sound entities' concerns</p>	<p>different program components</p> <p>Review cost estimates for consistency with Puget Sound Partnership needs and impacts on state and federal budget</p> <p>Report costs as part of the biennial cost estimates to implement Action Agenda</p> <p>For projects that PSP funds, oversee funding expenditure estimates</p>	



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			Monitoring entities	Work Groups	Technical Committee	Steering Committee	Science Panel	Ecosystem Coordination Board	Leadership Council	PSP Staff	
6	Advocate for and seek funding		Identify need for funding monitoring  Advocate for monitoring to legislature  Include monitoring needs in biennial budget requests  Seek funding	Consulted	Consulted	Consulted	Advocate for monitoring support to a variety of agencies and levels of government (e.g., Congress, legislature, state and federal agencies, tribes, NGOs, businesses)	Advocate for monitoring support to a variety of fund sources and political entities (e.g., watershed, local jurisdictions, legislature, state and federal agencies, tribes, NGOs, businesses)	Advocate for monitoring support to a variety of agencies and levels of government (e.g., Congress, legislature, state and federal agencies, tribes, NGOs, businesses)  Approve Puget Sound Partnership budget	Support and coordinate between different program components  Advocate for monitoring support and highlight that monitoring priorities are consistent with needs identified and agreed to by Puget Sound Partnership  Include monitoring needs in biennial budget requests  Seek funding	

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			Monitoring entities	Work Groups	Technical Committee	Steering Committee	Science Panel	Ecosystem Coordination Board	Leadership Council	PSP Staff	
7	Collect, manage, analyze and interpret data at the topic, local and/or ecosystem level	1a, 1b, 1c, 1d, 2a, 3a, 4a, 4b	<p>Collect, manage, analyze and interpret data at all levels, when appropriate and depending on entity goals</p> <p>Evaluate data</p> <p>Support GMAP performance measures, as part of the Monitoring entities' performance management systems.</p> <p>Work with PSP to ensure alignment of the PSP,</p>	<p>Determine what data need to be collected where and how, and identify the capacity to collect and analyze the information</p> <p>Ensure roll-up at regional scales</p> <p>Submit results to Steering committee with any comments</p> <p>Compile draft results from each entity for review and discussion</p>	<p>Synthesize findings</p> <p>Review and ensure robust statistical analyses and that all methods, calculations and interpretation s are available and transparent</p> <p>Ensure roll-up at regional scales</p> <p>Ensure QA/QC procedures are implemented</p> <p>Review for cross work group linkages</p>	<p>Review and resolve data problems identified by the Technical Committee</p> <p>Weights in data management</p> <p>Ensure transparency and accessibility of data</p> <p>In coordination with the Science Panel, review and confirm validity of assumptions and interpretation of results</p>	<p>Informed</p> <p>Review and confirm validity of assumptions and interpretation of and results</p>	<p>Informed</p>	<p>Informed</p> <p>Briefed on any problem areas</p>	<p>Support and coordinate data management, QA/QC, and analyses</p> <p>Lead effort, in terms of synthesis and roll-up across scales and topics</p> <p>Work with monitoring entities on any questionable results</p> <p>Conduct analyses for performance management</p>	Analyze, Use, Adapt

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			Monitoring entities	Work Groups	Technical Committee	Steering Committee	Science Panel	Ecosystem Coordination Board	Leadership Council	PSP Staff	
			GMAP, and EPA critical measures of success.		In coordination with the Science Panel, review and confirm validity of assumptions and results						
8	<b>Produce, report and communicate results in context and that meet needs of performance management (e.g., Puget Sound Partnership indicators, GMAP performance measures, EPA Dashboard indicators, etc.)</b>	2b, 4a, 4b	Provide results on a periodic bases to appropriate Work Groups  Collaborate with PSP staff and Work Groups to communicate results (e.g. State of the Sound report)  Produce and communicate their own	Provide results on a periodic bases to Technical Committee and PSP staff  Collaborate with PSP staff and Technical Committee on production and communication	Compile a summary report from all Work Groups and provide context  Collaborate with PSP staff on production and communication	Informed  Vet materials and recommend to Science panel how they are or should be used by policy groups (Leadership Council and Ecosystem Board) before the policy groups communicate	Review and endorse reports  Vet materials and recommend how they are or should be used by policy groups (Leadership Council and Ecosystem Board) before the policy groups communicate	Informed  Comment on reports to Science Panel and Leadership Council  Use good, relevant, vetted information, set in context, to communicate with member groups'	Review reports  Use good, relevant, vetted information, set in context, to Inform Governor, Legislature, Congress and media	Communicate ecosystem-level results and local and topic level as needed or appropriate  Produce PSP required reports (e.g. State of the Sound) in collaboration with Monitoring Entities, the Work Groups	<b>Capture and Share Learning</b>

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			Monitoring entities	Work Groups	Technical Committee	Steering Committee	Science Panel	Ecosystem Coordination Board	Leadership Council	PSP Staff	
			results to their stakeholders			to the Governor, Legislature, Congress, local constituencies or the media  Present reports to Science Panel	to the Governor, Legislature, Congress, local constituencies or the media	constituencies		and Technical Committee  Communicate indicators and targets and performance management work processes and deliverables to inform stakeholders, partners and PSP staff  Update website  Produce Action Agenda, Biennial Science Work Plan and State of the Sound	
9	Revisit questions, assess data gaps and uncertainties and address	1	Collaborate with Work	Evaluate questions,	Synthesize evaluation of	Develop recommendat	Informed and provide input	Informed and provide input	Informed and provide input	Staff will develop and	Capture and Share

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			Monitoring entities	Work Groups	Technical Committee	Steering Committee	Science Panel	Ecosystem Coordination Board	Leadership Council	PSP Staff	
	performance findings to adaptively manage monitoring program in response to adaptive management, policy decisions and scientific needs		Groups and PSP staff to evaluate questions, gaps, priorities, methods and modify using adaptive management tools	gaps, priorities, methods and modify using adaptive management tools  Synthesize evaluation results at topic level	questions, gaps, priorities, methods and modify as needed using adaptive management tools across topics	ions on needed modifications and re-alignment of monitoring plans  Influence appropriate decision-making processes	Influence appropriate decision making processes	Influence appropriate decision making processes	Influence appropriate decision making processes  When change is required, facilitates/moderates discussions about modifying the Monitoring Program, monitoring plans or activities of monitoring entities	manage a process and advise the Steering Committee  Make recommendations to SP, LC, and SC	Learning